The Refrigeration Service Engineer

Vol. 3
No. 5

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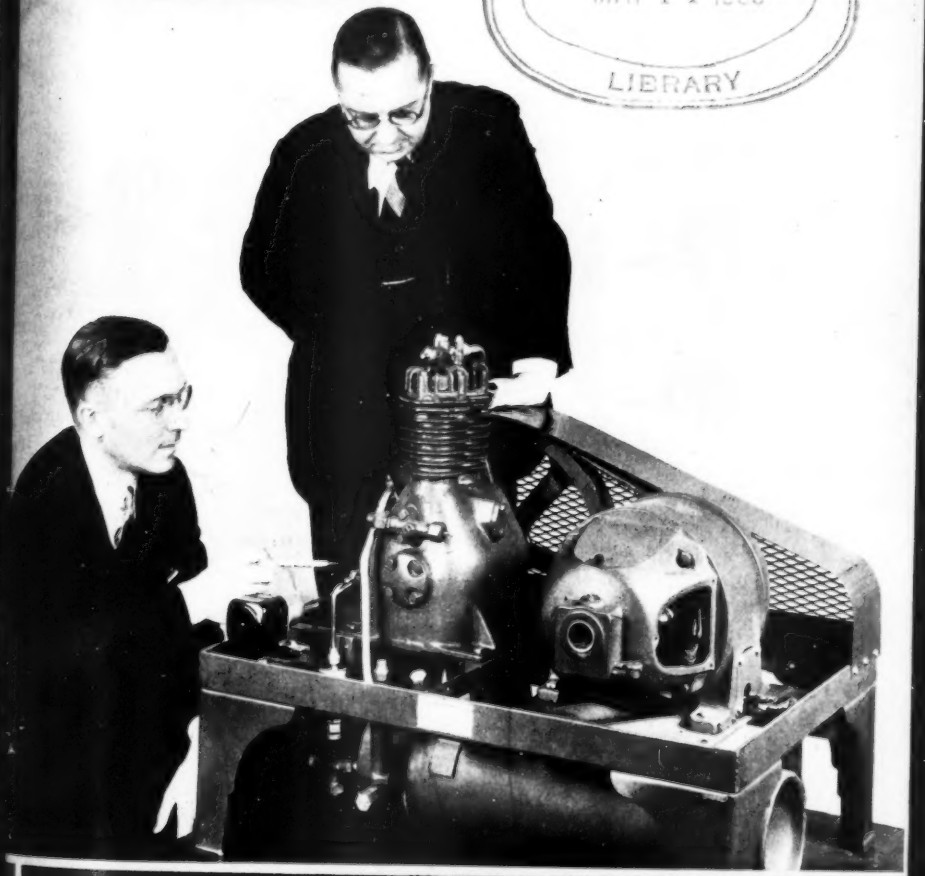

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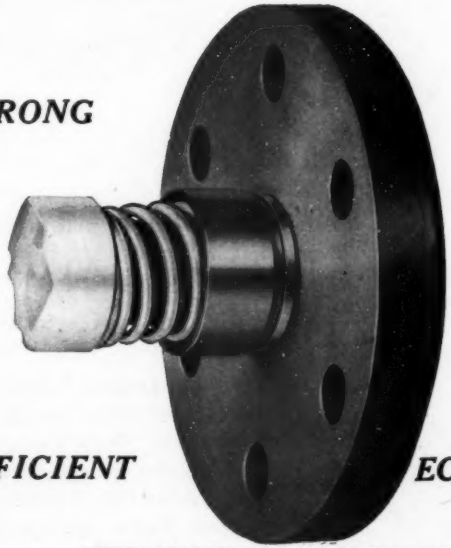

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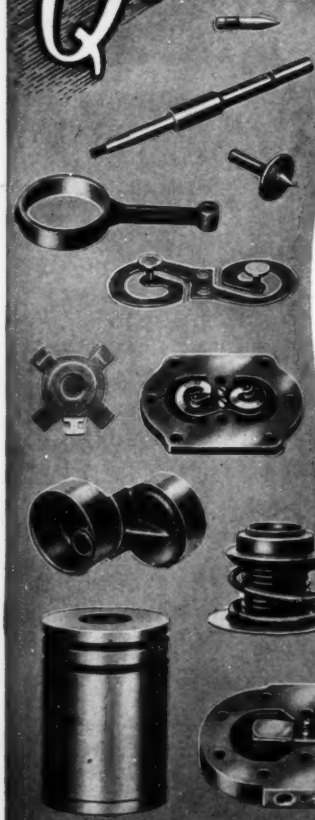

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Devoted to the Servicing of
REFRIGERATION UNITS *and* OIL BURNERS

VOL. 3 MAY, 1935 NO. 5

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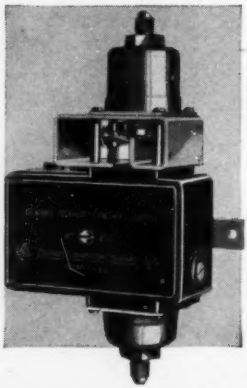

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The Refrigeration Service Engineer

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

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Operation and Servicing on Models 13A, 14A and 23A, 24A Servel Electric Units

The Single and Two Cylinder Servel Electric Unit Service Pointers. Description and Servicing of Component Parts. Illustrations

THE Model 13A, 14A and 23A, 24A units were manufactured by Servel Sales, Inc., Evansville, Indiana, about six years ago. These units are the conventional reciprocating type of compressor using methyl chloride as the refrigerant. The 13A and 23A units were manufactured for remote installations. Otherwise, the designs in both series are the same, the 13 series being the single-cylinder and the 23, the two-cylinder.

13A, 14A Units

In Fig. 1 is shown the cycle of operation, using the low-side float cooling unit. The 13A, 14A units used the air-cooled radiator type condenser in combination with a receiver driven by 1/6 h.p. motor, V-belt drive. The condenser-receiver has a capacity of 1¾ lbs. of methyl. The entire charge for the system is approximately 2⅛ pounds. The capacity of the 13A, 14A units, operating in room temperature of 90° F. and with suction pressure of 14 lbs., produces approximately 85 lbs. I.M.E., based on 16-hour operation.

Fig. 2 illustrates cut-away view of the 14A single-cylinder compressor, using splash system of lubrication, of which the base of the compressor contains approximately one pint white compressor oil. The cylinder wall has a port cut in it, and the piston is so constructed that the pressure existing in the low-side is always exerted on the under side of the flapper-type valve secured to the piston head. The discharge valve is of the flapper-type, capable of handling either vapor or liquid. The piston has three piston rings, two of which are the compression rings, and the third, located in the skirt of the piston, is an oil-wiping ring. The piston is reciprocated by means of a counter-balanced eccentric and rod assembly. The seal assembly design on this unit makes it particularly easy to remove in the field.

Condenser Assembly

The condenser and receiver are an integral unit, and as above stated, is of an air-cooled radiator type, mounted on the receiver as shown in Fig. 3. The receiver furnishes sufficient additional capacity so that a reserve supply of refrigerant is available. Receiver valve is a one-way shut-off valve, mounted on the end of the receiver. Turning it clockwise will fully seat it. To open full way, do not give valve more than two complete turns. Watch the packing gland nut to prevent leakage around the stem. A strainer will be found placed in the outlet line of the receiver. Fusible plug is placed at one end of the receiver to prevent the possibility of an excessive pressure building up in case the unit is exposed to extreme temperature. The melting point of the fusible plug is 280° F.

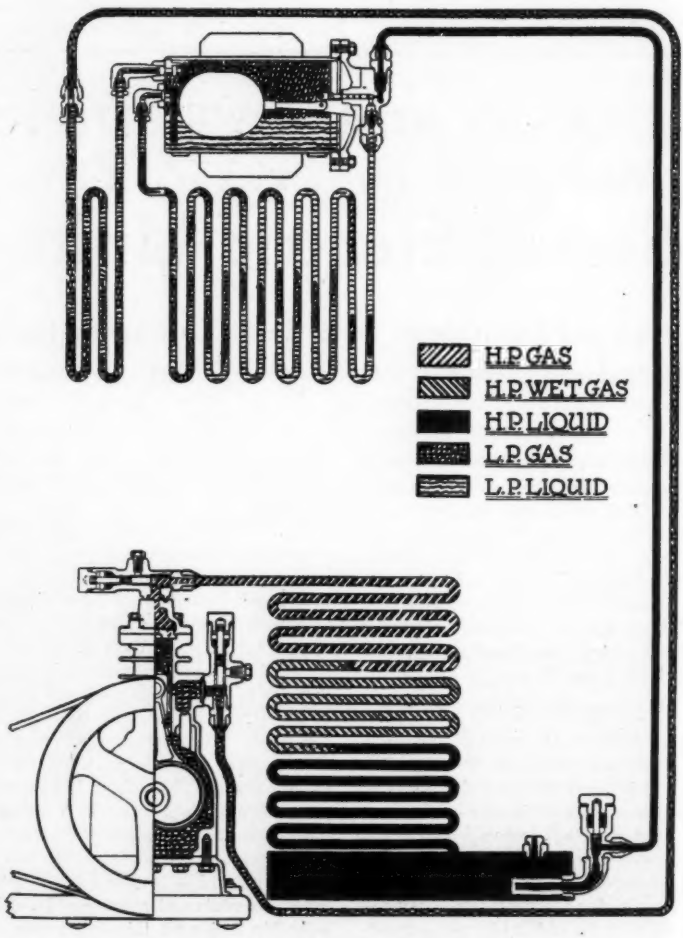


FIG. 1. CYCLE OF OPERATION

Thermostat

The thermostat used on the 14A unit is illustrated in Fig. 4. The difference between the cut-in and cut-out points is fixed and cannot be changed. Regulating the knurled brass pressure ring screw, which is in the end of the thermostat body, will raise or lower both of these points. This enables the service man to compensate for a few degrees change in the refrigerator temperature.

The 23A, 24A Units

These Servel models are the two-cylinder, air-cooled radiator type condenser, with separate receiver, driven by ¼ h.p. motor. The adjustable wide-range pressure control, placed on these units, was designed to be suitable for direct-expansion or chilling tank low-side. Each receiver has a capacity of 4 lbs. of methyl.

Capacity of Two-Cylinder Units

The capacity of these twin-cylinder models in a 90° F. temperature room with suction pressure of 14 lbs., will produce approximately 170 lbs. I.M.E., based on 16-hour operation.

24A Compressor

The 24A compressor shown in Fig. 5, is lubricated by the splash system, and the oil capacity contains approximately 1½ pints of white compressor oil. The cylinder walls have ports cut in them, and the pistons are so constructed that the pressure existing in the low-side is always being exerted on the under side of the flapper-type valve secured to the piston head. The discharge valves are of the flapper-type, which are self-actuating to handled either vapor or liquid.

The piston is reciprocated by a drop-forge and hardened-steel crankshaft, and connecting rods. The piston rings are made of a special bronze alloy, and intended to

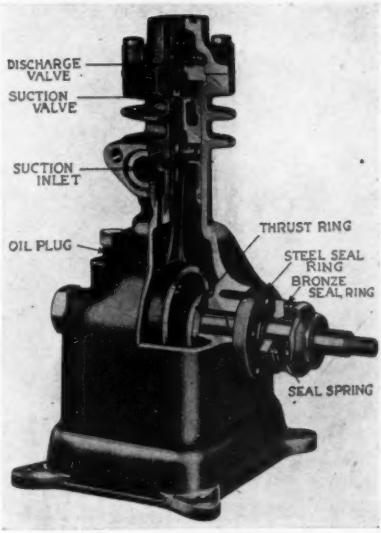


FIG. 2. CUTAWAY VIEW SERVEL 14A, SINGLE CYLINDER COMPRESSOR

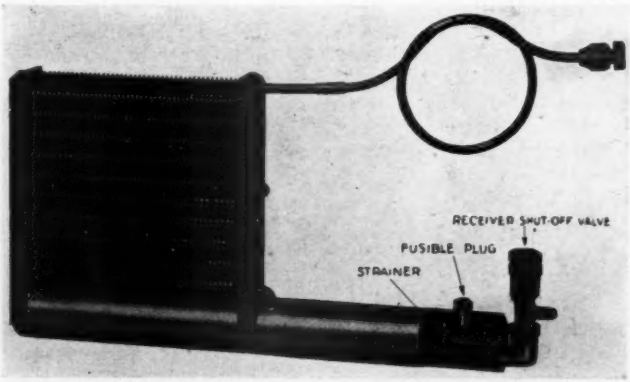


FIG. 3. CONDENSER-RECEIVER ASSEMBLY, FOR MODEL 14A COMPRESSOR

make a gas-tight seal in the inserted hardened-steel cylinder sleeves.

Condenser-Receiver

The condenser is mounted, in this model,

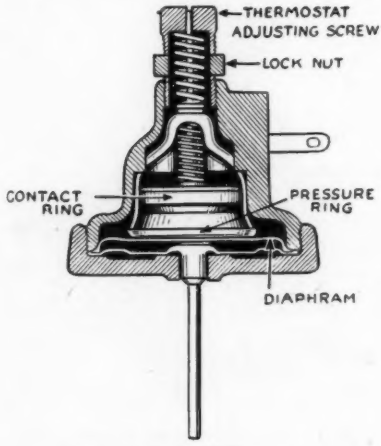


FIG. 4—THERMOSTAT—14-A

independently of the receiver. The receiver is suspended beneath the pressed-steel base equipped with a fusible plug, having a melting point of 280° F.

The charge in the receiver is 4 lbs. of methyl chloride. The condenser and receiver shut-off valves are of the one-way type, and two full turns will open wide.

Pressure Control

The pressure control is a standard Servel Pressure Control, with a bellows guide in place of the throttle piston, and an auxiliary loading spring.

In this pressure control is an auxiliary loading spring, which makes possible a range of 20 lbs. between the cut-in and cut-out pressures. The standard setting will be 3 lbs. cut-out to 20 lbs. cut-in pressure.

Low-Side Float Chilling Unit

The cooling unit is a combination of a series evaporator and a low-side float. The auxiliary vaporized coil, located between the outlet of the float shell and the return line to the compressor, is for the purpose of evaporating whatever liquid methyl chloride may be drawn out with the oil.

Liquid Line Filter

Between the ¼" liquid line and the float needle seat, there is a filter. The use of this filter between the receiver and the float is designed to remove all foreign matter from the system with the exception of moisture. The float needle valve assembly is illustrated in Fig. 6. The filter is so designed that either side may be used for the inlet; therefore, there are no special precautions to be taken when first connecting it in the line. The filter cannot be taken apart or cleaned, but must be replaced. Before removing a filter, mark on the filter the direction of the flow of liquid through filter. This is a precaution that is important, otherwise whatever dirt that may have been trapped, will be washed into the float should the direction of the flow be reversed. In Fig. 7 is illustrated the float shell and liquid return device.

Pumping the Vacuum on the 13A, 14A

The operation of the 13A, 14A unit is thermostatically controlled. Inasmuch as

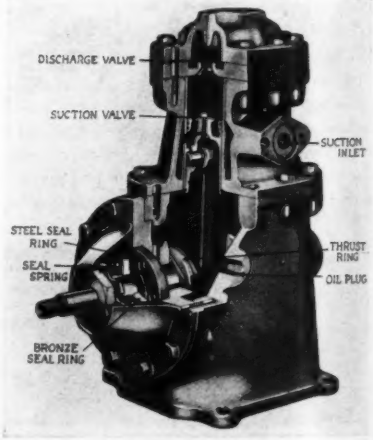


FIG. 5. CUTAWAY VIEW SERVEL 24A, TWIN CYLINDER COMPRESSOR

the temperature of the evaporator coil, where the thermostatic bulb is located, is greater than the point at which the thermostat is set to cut in, there is already a complete circuit through the thermostat.

Remove the discharge shut-off valve serv-

ice port plug. Slightly open the valve and note if there is a strong flow of methyl, such as you get from a well-filled drum. Should this be the case, there is no need to pump a vacuum on the condenser-receiver. Close the valve. Proceed as follows:

main constant, there is a leak either in the charging connections or in the valve packings.

Important: Never charge or add methyl chloride to the system in the liquid form. There is a great risk of introducing dirt into

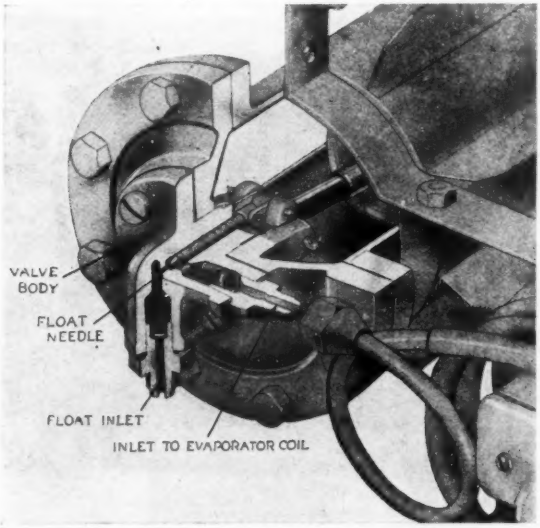


FIG. 6. FLOAT NEEDLE VALVE ASSEMBLY

Attach a ¼" flared tube elbow, to the service port of the discharge shut-off valve. Attach a piece of ¼" copper tubing to this ell by means of a ¼" flared tube nut. Place the other end, with another ¼" flared tube nut on it, into a container. This will prevent oil being blown over the machine should the compressor pump oil. It will also make it possible to tell when there is no more air being discharged from the system.

Remove the suction shut-off valve plug and attach a compound gauge and a drum of methyl to the service port on the suction shut-off valve. Close this service port by turning suction shut-off valve stem counter clockwise until valve is seated, and test the charging connection for possible leaks by opening the valve on the methyl drum and permitting the pressure to build up to 20 or 30 pounds. Close the valve on the methyl drum, and watch the gauge. If the pressure, as shown by the gauge, does not remain constant, there is a leak either in the charging connections or in the valve packings.

Important: Never charge or add methyl chloride to the system in the liquid form. There is a great risk of introducing dirt into the system. Always add methyl chloride as a vapor and through the suction shut-off valve service port.

Before starting to pump a vacuum, remove the seal guard and lubricate the seal joint, *but do not pry the faces apart.* The oil cups on the motor should be filled at this time.

Start the machine operating. If it pumps oil excessively, stop the machine and warm the compressor. A compressor may pump oil because of methyl chloride which mixed with the oil during test runs.

Start the machine and allow it to operate until the compound gauge shows 27 to 28 inches of vacuum and no more air is being discharged from the system. Stop the machine and allow it to rest for ten to fifteen minutes. If the vacuum holds, all joints are probably tight. If it does not hold, or if you are unable to draw a vacuum of 27 to 28 inches, there is a leak somewhere. Go

over all joints and tighten them carefully until you can draw and hold this vacuum. After you are able to draw and hold this vacuum, the machine is ready to be charged.

Do not touch the discharge shut-off valve.

Open the receiver shut-off valve. Allow the methyl to completely fill the system. While it is slowly escaping from the discharge shut-off valve by-pass, attach a high-pressure gauge and build up a pressure of 30 lbs. Close the receiver shut-off valve and test for leaks.

Open the discharge shut-off valve three turns. Note the pressure. Screw the fuse plug into the box and open the suction shut-off valve and service drum valve sufficient to maintain 30 lbs. pressure on the compound gauge. Keep your eye on the head pressure gauge and watch for the point when the pressure begins to rapidly increase. When the head pressure reaches 170 to 175 lbs., close the service drum valve and stop the machine.

You have now a full charge. Open the receiver shut-off valve two full turns. Replace valve stem cap and test for leaks. Start the machine operating and keep the suction pressure below 30 lbs. Throttle at suction shut-off valve if necessary.

The chilling unit will shortly show a light frost, and there will be heard a hissing noise at the float valve. This indicates that the liquid is passing the needle.

The needle valve will continue to open and close until the temperature of the chilling unit is reduced to the cut-out temperature when the valve will remain closed until unit warms up, boils off sufficient liquid to lower the ball, open the valve and permit other liquid to enter the chilling unit.

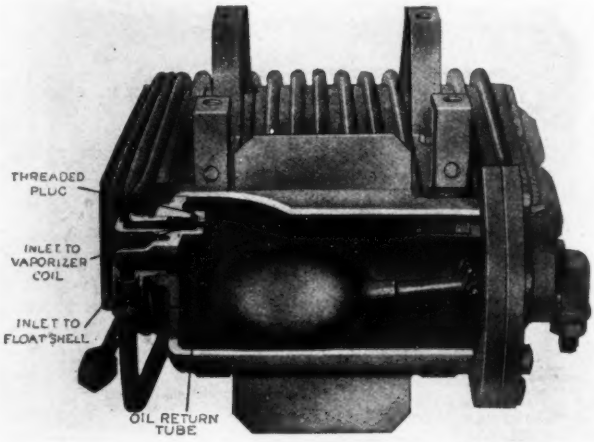


FIG. 7. FLOAT SHELL AND LIQUID RETURN DEVICE

After the cabinet and contents have cooled down, the machine will run from 10 to 30 minutes, and will rest from 10 to 45 minutes. The total running time will be from one to two-thirds of the time. This will depend upon the surrounding temperature, the duty of the cabinet and the setting of the thermostat and pressure control.

Check the head pressure, and if normal, close valve, remove gauge, etc., then plug the service port. Test for leaks. Leave the compound gauge attached and check cut-out and cut-in pressure.

Pumping the Vacuum on the 23A, 24A

Means for checking the quantity of methyl in the receiver has been provided by extending the condenser shut-off valve boss into the receiver. When the receiver contains the proper amount of methyl, the boss will project below the level of the liquid. Cracking

the condenser shut-off valve will allow liquid to escape when the receiver contains the proper amount of methyl. A lower liquid level can be determined by raising the opposite end of the receiver until liquid escapes.

Remove the discharge shut-off valve plug and open the valve two turns. Slightly open the condenser shut-off valve in the receiver and permit methyl chloride vapor to blow through the condenser and out of the discharge shut-off valve. Allow this to continue for approximately ½ minute, which will be ample time for the methyl chloride to completely remove all air from the condenser and its connections. While the methyl chloride vapor is still escaping, close the shut-off valve so as to prevent any further escape. The condenser shut-off valve should now be opened two full turns, and the cap replaced, care being taken to hold the valve with a wrench while tightening the cap.

Make certain that the discharge shut-off valve is completely closed, that the receiver shut-off valve is also closed, and that the suction shut-off valve is neither fully opened nor closed. The rest of the procedure is the same as outlined for models 13A and 14A.

The operation of the 23A, 24A unit is controlled by the pressure in the low-side. The pressure control is set to open when the pressure falls below 3 lbs. per square inch. Therefore, the switch may be open and the machine will not run. To cause the machine to operate, it may be necessary to short the switch by placing a piece of metal in contact with the two poles of the switch.

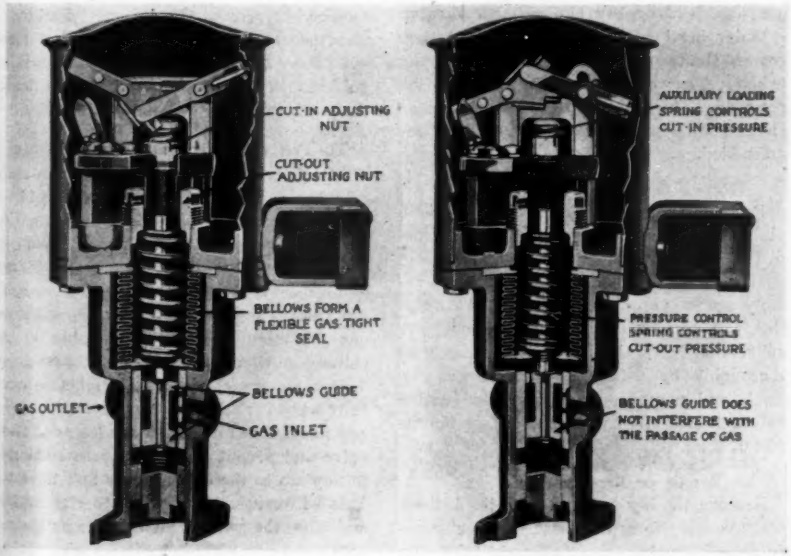
Correct Charges for Units

It is important that the machine be charged with the correct amount of methyl chloride. The charge for 13A, 14A unit is approximately 2⅛ lbs. The proper charge for the 23A, 24A unit is approximately 4 lbs. In the event that the methyl chloride has all escaped, it will be necessary to pump a vacuum on the whole system, as well as remove all air from the condenser receiver.

SUGGESTIONS FOR MISCELLANEOUS REPAIRS AND ADJUSTMENTS

To Remove Compressor

When replacing the compressor, it is necessary to pump a vacuum on it. After attaching the shut-off valves, remove the discharge shut-off valve plug and start machine.


CUT-IN ADJUSTING NUT
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GAS INLET
AUXILIARY LOADING SPRING CONTROLS CUT-IN PRESSURE
PRESSURE CONTROL SPRING CONTROLS CUT-OUT PRESSURE
BELLOWS GUIDE DOES NOT INTERFERE WITH THE PASSAGE OF GAS

Open Closed

FIG. 8. VIEW OF PRESSURE CONTROL

Allow it to operate until the proper vacuum has been drawn. Replace the plug, but do not tighten. Adjust the suction shut-off valve to normal operating position, and while the methyl is blowing past the plug, tighten it up. Open discharge shut-off valve all the way.

Repair or Replace Discharge Valve

Proceed as in removing compressor, but do not remove nuts holding it to base. Do not remove suction shut-off valve. Remove cap screws holding compressor head to cylinder housing and take off head. With the head removed, the discharge valve assembly is readily removable from the top of the cylinder housing.

13A, 14A Discharge Valve

The discharge valve assembly is a composite unit. Remove the three screws which hold the valve retainer to the plate. Remove the three valve leaves, and clean the discharge valve plate. Re-assemble by using a new valve leaf next to the plate, reversing the above operation.

23A, 24A Discharge Valve

This discharge valve assembly consists of a plate, three spring steel leaves secured by a bridge held by two cap screws. Remove cylinder head as outlined above, and then remove the two cap screws holding down the bridge. The valves and plate may then be removed. The seats on the plate should be cleaned with Luminox paper, and then re-assembled.

Repair or Replace Suction Valve

Proceed as in removing discharge valve plate assembly. By turning the shaft, the piston can be raised until the suction valve on the piston is readily accessible. To remove suction valve, remove the $^{19}/_{32}$ nut from the stationary stud in the piston body, lift off suction valve, then clean the piston head thoroughly by using Luminox paper, No. 320A, and re-assemble, using a new suction valve. This valve must seat closely on the piston head.

Repair or Replace Shaft Seal

Remove the hex-nut and take the bellows seal assembly from the shaft. Inspect carefully to determine any scoring of the bearing surfaces either on the seal or on the ring. The bellows and the soldered joints should also be examined. If the seal ring should be damaged, it is readily removable in the field by taking out the fillister head screws, which hold it to the crankcase. When replacing the steel seal ring, it will be necessary to center the ring with the shaft. The ring may be centered by slipping the bellows assembly on the shaft and forcing the spool through the ring, thus centering the ring.

To Remove the Switch Head from Pressure Control

The open and closed views of the pressure control are shown in Fig. 8. Attach suction gauge to suction shut-off valve. Crack valve. Remove wires, which are attached to the terminals on switch plate, and connect them together. Turn on line switch and permit machine to run until the pressure on the gauge registers and stands fast around 10 lbs. Remove the three brass screws holding micarta switch plate to binding post. Grasp the switch assembly in the hand and turn to the left. This will disconnect the switch push rod from the bellows. Carefully count the number of turns required to remove the switch. When replacing switch, make sure you give it the exact number of turns required to remove the old one. Failure to give the switch the proper number of turns will throw off adjustment of the bellows guide to such an extent that the operation of the machine will be seriously affected.

To Test the Switch or Pressure Control

Attach compound gauge to suction shut-off valve and crack valve. Start machine, if it is not already running, by closing the pressure control switch by hand. Close condenser shut-off valve. This prevents any liquid methyl chloride entering float or chilling unit. The compressor will rapidly draw out the methyl chloride remaining in the chilling unit, and the pressure will go down. Watch the compound gauge and note carefully what it registers when the switch opens and machine stops. Open condenser shut-off valve and permit the liquid methyl chloride to flow up to the chilling coils and the float. This will cause the pressure to rise rapidly and close the switch. Watch the gauge and note carefully what it registers when switch closes.

Assembly Removal Chart—Models 23A, 24A
Position of Shut-off Valves

To Remove	Suction	Discharge	Receiver	Condenser	Location of the Charge
Chilling Unit	Closed	Open	Closed	Open	Condenser and Receiver
Compressor	Closed	Closed	Open	Open	Condenser and Receiver
Condenser	Open	Closed	Open	Closed	Receiver
Float Valve	Closed	Open	Closed	Open	Condenser and Receiver
Pressure Control	Closed	Open	Closed	Open	Condenser and Receiver
Receiver	Closed	Closed	Open	Open	Pump charge into service drum
TO Pump Vacuum	Cracked	Closed	Closed	Open	Air has been blown out of the condenser and the methyl is in the receiver and condenser
Pump Vacuum	Cracked	Closed	Open	Open	Machine is discharged and methyl is in drum
Add Methyl	Cracked	Open	Closed	Open	Methyl throughout system and methyl in drum

Assembly Removal Chart—Models 13A, 14A
Position of Shut-Off Valves

To Remove	Suction	Discharge	Receiver	Location of the Charge
Chilling Unit	Closed	Open	Closed	Condenser and Receiver
Compressor	Closed	Closed	Open	Condenser and Receiver
Condenser	Closed	Closed	Open	Pump charge into service drum
Float Valve	Closed	Open	Closed	Condenser and Receiver
TO Pump Vacuum	Cracked	Closed	Closed	Condenser and Receiver
Pump Vacuum	Cracked	Closed	Open	Machine discharge and methyl in drum
Add Methyl	Cracked	Closed	Closed	Methyl throughout system and in drum

Testing Float Needle for Freedom of Movement

Proceed as in testing float for leak. With float head in usual position and with float ball removed, the weight of the arm should be sufficient to pull the needle from its seat irrespective of the amount of pressure which has been applied to the needle.

Adding or Changing Oil in Compressor

To change the oil in the Servel compressor, it will be necessary to remove the compressor as previously explained in this article. When replacing a compressor, note the oil level in the compressor being removed, and see to it that the new compressor has oil to this level. Should the oil level be below the center of the crankshaft, fill to this level in all cases.

Adjustment of Pressure Control Range

The setting on which the switch works can be changed. The pressure at which the switch opens the circuit can be changed by adjusting the compression on the main spring by means of the large brass adjusting nut directly under the micarta switch plate. Loosening the nut releases the compression on the spring, and will lower the temperature reading. Tightening the nut increases the compression on the spring, and raises the temperature reading. The cut-in pressure is regulated by adjusting the small steel nut located just above the black hard rubber connecting sleeve on the switch eye bolt. Tightening this nut compresses a small spring, which delays the switch action and thus raises the cut-in point. The two adjustments work independently of each other, which makes it possible to get an infinite number of readings. The cut-in point on the K line of boxes should be 19 or 20 lbs. Any adjustment for box temperature should be made on the cut-out point, which has been determined as 3 lbs., for best results.

To Test Discharge Valves for Leak

Attach compound gauge to suction valve. Start machine. Close suction valve. Turn to the right as far as it will go. As soon as suction valve is closed, stop machine. Don't let machine run with suction valve closed, as

THERMOSTAT CONTROLLED MACHINE

Possible Complaints and Remedies

General Conditions		Apparent Troubles	Remedies
Machine runs continuously	Chilling unit does not frost	Low on charge.	Locate, correct leak and charge.
		High back pressure.	
		Dirt under suction valve.	Repair or replace suction valve.
		Leaking discharge valve.	Repair or replace discharge valve.
		Float stuck open.	Be certain leak is at needle seat, reseat needle and test float for leak.
		Frozen or stuck float needle. Clogged needle opening.	Discharge system completely. Remove float head. Dry thoroughly. Test float for freedom of movement. Reassemble recharge.
		Oil return assembly clogged, float shell filled with oil, holding needle in closed position.	Discharge system completely, remove float head. Apply pressure to suction line while holding finger over orifice at inlet to vaporizer coil. This will blow out tube. Test suction valve for leak. Repair.
	Chilling unit does frost	Dirt under suction valve.	Test suction valve for leak. Repair.
		Leaking discharge valve.	Test discharge valve for leak. Repair or replace discharge valve.
		Not sufficient circulation of air at condenser.	Check rotation of motor. Make sure there is proper circulation of air at condenser.
Machine runs on short cycles	Chilling unit does frost	Low charge. Not enough to keep float closed.	Locate, correct leak, add charge.
		Slow make and break, contacts burned.	Clean contacts and check thermostat action.
		Thermostat diaphragm not snapping.	Change thermostat.
Machine will not run	Chilling unit does not frost	Compressor binding or stuck.	Replace compressor. Overhaul bound compressor at shop.
		Belt broken.	Determine cause and replace belt.
		Thermostat defective.	Test thermostat. Replace thermostat if defective.
		Fuse burned out.	Determine cause, check for overload and replace fuse.
		Faulty wiring.	Check and repair wiring.
		Motor trouble.	Determine if because of overload. Replace motor if necessary. Fuse properly.
		Faulty contact at thermostat receptacle.	Make proper contact.

PRESSURE CONTROLLED MACHINE

Possible Complaints and Remedies

General Conditions		Apparent Troubles	Remedies
Machine runs continuously	Chilling unit does not frost	Dirt under suction valve.	Repair or replace suction valve.
		Leaking discharge valve.	Repair or replace discharge valve.
		Leaking at float needle which keeps suction pressure above 20 lbs.	Be sure you are right. Remove float head and repair needle seat.
		Low on charge.	Add charge. Find leak, repair.
		Contacts burned together.	Clean and adjust contacts.
	Chilling unit does frost	Switch shorted.	Locate and remove short.
		Switch trip spring broke.	Replace broken spring.
		Pressure control set too low.	Set pressure control to cut in at 20 lbs. and cut out at 3 lbs.
		High head pressure.	Find cause—Remedy.
		Pressure control set too close.	Set pressure control to cut in at 20 lbs. and out at 3 lbs.
Machine runs on short cycles	Chilling unit does frost	Leak at float needle.	Be sure you are right. Remove float head and repair.
		Low on charge.	Find leak, repair, add charge.
		Pressure control set too high.	Set pressure control to cut in at 20 lbs. and out at 3 lbs.
		Oil in float due to clogged oil return tube.	Pump charge into receiver. Remove float head.
		Compressor binding or stuck.	Replace compressor. Overhaul compressor at shop.
Machine will not run	Chilling unit does not frost	Belt broken.	Determine cause and replace belt.
		Fuse burned out.	Determine cause, check for overload and replace fuse.
		Faulty wiring.	Check and repair wiring.
		Motor trouble.	Determine if because of overload. Replace motor if necessary. Fuse properly.
		Faulty contact at pressure control.	Clean and adjust contacts.
		Complete loss of charge.	Apply pressure. Locate leak. Repair leak. Pump Vacuum Charge.

you will quickly draw a vacuum on the compressor. When you stop the machine, compound gauge will register from 5 to 10 lbs. pressure. Watch the gauge. If the pressure on gauge builds up slowly, this is due to the warming up of the methyl in the compressor. The discharge valve is tight. If the pressure on gauge builds up rapidly, the valve is leaking. If the discharge valve leaks or is held open, it will not be possible for it to hold the high pressure in the condenser from flowing back into the pressure control where it will go in the switch and start the machine.

Thermostat Settings

The suction pressure at the time of the cut-in and cut-out should be as follows:

Model	*Thermostat Temperature Range*	*Pressure Range*
D-5	4° to 6°—28° to 31° F.	4 lbs.—20 lbs.
K-5	4° to 6°—28° to 31° F.	4 lbs.—20 lbs.

One turn of the find thread adjusting screw inward will raise the cut-in and cut-out points approximately 2° F.

Testing Float for Leak

To test a float for a leak at the needle, remove the float head and attach a drum of methyl with a gauge in the line to the inlet connection. Invert the float head from its usual position, allowing the weight of the float ball to act as a means for closing the valve. The float ball should be lowered gradually so as to gently seat the needle, which must be tight, with only the weight of the ball applied, and without any additional pressure. Apply 80 lbs. pressure to the inlet connection by cracking the valve on the methyl drum. A leak is readily detectable by placing oil on a finger and holding it lightly against the outlet connection. Leakage around the guide of the float needle does not affect the operation of the machine. In case a float leaks at the needle, remove the needle and examine the needle surface. If there is any indication of scoring, replace with a new needle assembly.

NOISELESS OPERATION

THE quietness of operation of domestic refrigerators has been a problem of paramount importance. Also, we find that this same consideration is holding true in commercial installations. A sound or noise becomes evident only when its intensity exceeds, or its frequency differs materially from that of the existing sounds. This can be usually demonstrated when in the search of noise-producing elements, the one that is presumed to be offending has been located, only to reveal some new, unobserved noise has made its appearance.

Oftentimes these noises are extremely difficult to locate, and this particularly holds true of noises that come from within the compressor. The metallic parts of the unit conduct the sound throughout the entire assembly. Once the noise is located, investigation naturally resolves itself upon determining the cause of the noise. Usually the correction is not so difficult as is the location and the cause.

It will be generally found that common sources of noises in condensing units include loose parts, such as: motor pulleys, fly wheels, motor junction boxes, compressor and motor mountings as well as air noise created by the fan, and, of course belt noises are frequently a predominating source. Internal noises of the compressor can be, in most cases, traced directly to poor fit of running parts and improper lubrication.

Noise tests are all comparative. Instruments are now available, which enable the observer to measure the intensity of sound. In the absence of equipment of this character, the examination and comparison of noises by ear is productive of fairly reliable results. A commonplace method of locating the source of trouble consists of a metal rod, insulated where held by the hand, and with one end in contact with the equipment at various points, and the other end against the ear, the sounds generated within become more distinct. The process of locating the noise is largely a matter of trial and error, with the field of possibilities limited insofar as possible by the analysis of the noise.

Recent Trends forecast the Future of Refrigeration Servicing

By H. T. McDERMOTT

SOME years ago, (eighteen to be exact) when domestic electric refrigeration was a mere infant, *Ice and Refrigeration*, a leading trade journal in the refrigeration field, predicted that the "then new mechanical household refrigerators would not likely prove a commercial success until the manufacturers of such equipment were prepared to provide proper service facilities for their units."

Naturally, the object uppermost in the minds of the manufacturers at that time was to secure the acceptance of the public for the use of mechanical household refrigeration. In short, it was a matter of selling.

How true this prophecy was is now a matter of record within the memory of a large number of men engaged at the present time in this vast enterprise. It is to the credit of those large and well-financed corporations who entered the field of domestic mechanical refrigeration visualizing its potential growth, and immediately organized service departments and schools for the training of service men, from which a large percentage of the men established in business today received their basic servicing education.

The industry, as it continued its growth, attracted other engineers, who had been identified with the erection and servicing of larger refrigeration equipment, and who in turn, established their own servicing organizations. A natural cycle of events was taking place. Qualified service men, seeing the opportunity of a profitable business for themselves, opened community service stations, and these were classified as independent service concerns.

The failure of many distributors of refrigeration equipment and the necessary business re-adjustment, released many trained service men who sought to capitalize on the training they had received by establishing themselves as independent service engineers. These men proved to be a salvation for the purchasers of many orphan machines which had several years of useful service still available.

During many periods of re-adjustment and advancement in the field, the independent servicing organizations were continuing to show substantial growth each year, commensurate with the increasing sale of electric refrigeration. During the past few years, the growth of independent servicing has been further emphasized, and may be logically traced to several important factors that have contributed in no small measure to this growth. As the servicing profession is carefully studied, we find that many changes parallel those which occurred in the automotive field. In fact, as this analysis is studied more thoroughly, we find that two large and important industries have something in common, to which their advancement can be definitely traced.

Within the memory of many of us, it doesn't seem such a far step back to twenty-five years ago when the average car owner could be depended upon to spend as much time under his car as he spent in it. In

those days, automobiles were a complicated piece of machinery, and no long distance driving was considered unless the owner or driver of the car was thoroughly familiar with its mechanics and was able to make road repairs on any trouble that he was likely to encounter. It was a delicate piece of machinery at best, and the necessary trips to factory branches for servicing were most frequent. These branches were few and widely scattered throughout the country, and convenient only to a comparatively few purchasers.

It didn't take the automotive industry long to learn that sales were dependent upon service facilities, and the establishment of convenient service stations brought about the standardization of many parts used in the construction of the motor car. Following this event, a large independent parts, service and accessory industry soon made its appearance, and with established service facilities, its growth was a foregone conclusion. Almost immediately, the fact that the purchaser was assured of definite service added impetus to the sale of cars. Also, it was a protection, to some extent, that these service organizations would be in a position to supply parts for the cars of manufacturers that might go out of business.

Consider today the amount of automotive servicing that is done by these independent organizations. Hardly a mile of travelled road, either city or rural, is not dotted with automotive service stations.

Market for Servicing

It is only natural, then, that the mechanical refrigeration industry would take a page from the experience of the automotive industry. Today, mechanical refrigerators in use are counted in the millions, with thousands being produced daily and put into service. The growth of the independent servicing field has made rapid strides. An attempt to arrive at some estimate of the number of men engaged in this business has been made, but due to its increasing growth, no two sources of figures seem to agree, except all, however, are of the same mind that this business is a vital and important factor in the refrigeration field today.

The men, who have established themselves in this industry, are seriously concerned in building their business for the future, and recognize fully that the success of their venture in their community is dependent upon their ability to serve the customer in the best manner possible. In fact, it can be truthfully stated that the bulk of the business that has found its way into the channels of independent servicing has been through satisfied customers.

Manufacturers Have Contributed to the Efficiency and Success of Independent Servicing Organizations

One of the contributing factors to the success and growth of this field has been a recognition by the manufacturer of refrigeration accessories and supplies as to the potential market this field offers. In the establishment of branch offices and the development of jobber distribution, we find that the servicing organization has been provided with facilities, irrespective of geographical location, insuring deliveries on short notice. Also, the printed literature and complete catalogs, which have been prepared and distributed to servicing organizations, have brought the source of supply much closer to the user.

It has indeed been gratifying to find that independent servicing has secured recognition from some large refrigerator manufacturers. It is hoped that a closer understanding of the mutual interests of all manufacturers and independent servicing can be anticipated for the benefit of the entire industry.

In the final analysis, in looking forward not only to the development of new refrigeration and air conditioning uses, but also with the improvement of the processes of distribution and service, it can be well-said that this industry is on its way to establish new records.

It is interesting to learn what the trend is in refrigeration servicing. The Editor requested the opinion of some men who have been engaged in this business and have established themselves in their respective communities. These replies which follow contain constructive suggestions for the advancement of the business.

From Pennsylvania

"I feel that the demand for independent service is increasing because the customer feels that he can call on the independent service organization with a feeling that he will not be asked to buy new equipment. I have several customers who say that they get faster and more competent service from the independent organization.

"I would suggest a closer relation between manufacturer, distributor and the independent service organization.

"I have advertised some in the local papers, but do not believe I realized much return from this method. Most of my work has come from the advertising of my satisfied customers.

"Last fall, I had considered fitting myself for servicing oil burner equipment, but found that my refrigeration work was holding up sufficient to keep me employed throughout the winter.

"Many of the dealers in our town are dispensing with their service department and contracting their service with the independent service organization."

From Ohio

"In our particular territory, the demand has increased, because the independent service organization has been able to render a more personal service, with possibly less overhead costs to the customer. Also, the movement in the last few years to patronize your local independent businessman has benefited the independent service man greatly.

"The progress of independent servicing could be increased if their services were equivalent or better than the larger organizations. In a small city, where ten independent service organizations existed, if nine of these service organizations produced high quality workmanship and were able to satisfy the customer, and the tenth did not possess these qualities, even though the nine were the large majority, the tenth would hurt these organizations. Independent service organizations can help themselves greatly, by educating this tenth man, rather than knocking or ignoring him.

"We acquaint the public with our service by an ad in the telephone book and by personal solicitation. But our greatest advertisement is, we feel, our satisfied customers.

"To the best of my knowledge, there are about 185 men actively engaged in servicing and installing light refrigeration units. Of this number, some seventy are independent service men. The independent service man services practically all of the ice cream equipment in the city and a great share of the independent grocery and meat markets. The company-owned service practically all of the chain store equipment and a large share of the domestic units. Originally, the company-owned service departments serviced practically all of the apartment house equipment in our city, but very rapidly, this is being turned over to the independent service men, who have proved themselves capable of giving quicker service of the same caliber as the larger company.

"One of the biggest problems facing the independent service man at the present time is the difficulty in securing parts for standard make units at the recognized discount."

From Michigan

"It is my personal belief that the future of the independent service business depends entirely upon the quality of the service furnished by independent organizations. We find that the demand for independent service is growing, although we attribute this to the fact that more people are becoming familiar with the fact that it is possible to secure refrigeration service from other sources than the manufacturers representatives.

"We can not escape the fact that while in the many cases, manufacturers' service men are not the more competent, yet the manufacturer can and does furnish the best quality of material and maintains by far the best equipped repair shops.

"In the great majority of cases the independent service company is a small organization selling their service on a price basis and with little or no equipment for repair work; while there are a few independently operated repair shops who are equipped to do good work, these are in the minority.

"Correcting this situation, I suggest the following: Among the most necessary requirements for operating a repair shop I would list proper parts connections for securing replacement parts, competent repair men, proper equipment for dehydration, and proper testing equipment. You will notice that I have failed to mention carrying heavy machinery such as lathes, grinders, etc., and this omission is intentional. We found that this work can be done by outside machine shops much better and more economically than we could hope to do it without an investment far beyond its proportionate worth.

"We have experimented with several methods of securing new customers and find the most effective to be direct mail advertising. However, there may be other methods which might be more effective in some cases as we do not attempt to appeal to the low price business. We have often considered possibility of including other types of service in order to fill in the slack season but as yet have done nothing about it. We have based our advertising on the fact that we are refrigeration specialists and

for that reason have been hesitant in adding any other lines.

"None of us are in business for philanthropic purposes and all modern propaganda to the contrary, this is still a capitalistic world and the ear mark of success is and will continue to be the amount of net cash profit at the end of every year's operation. It is silly to try to tell ourselves and our customers that we are in business merely for the purpose of cutting their expenses and making it possible for them to make more money to our own exclusion. It is our ability to do a more satisfactory job that it is going to count."

From Missouri

"The demand for independent servicing has increased over manufacturer-owned service organizations, and this is more noticeable every day. More and more refrigerator installations of all types are running out of the free service period, and the objection to paying a high minimum service rate which the manufacturer-owned service organization must charge is creating a demand on the independent serviceman, who naturally can do the same work at a little less cost to the consumer.

"I think that the Refrigeration Service Engineers' Society is doing all that can be expected towards helping the progress of Independent servicing, and it is up to the Independent organizations to avail themselves of the opportunity of making some connection with this Society. Also personal initiative to work towards establishing a first class business, to operate as a first class business, and to do all business in a business-like manner.

"The method of advertising we employ is of course the ordinary kind, namely, the telephone directory, stickers, good service etc. Personal solicitation plus repeat business, and customer mouth to mouth advertising seems to be working very well. I do believe in more direct advertising when business will warrant this additional expense.

"For the winter slump, of course, we have given considerable thought and consideration, and we don't quite like the idea of taking on other types of service work, especially when the type of work is being serviced by organizations in that particular business. We, of course, do not like the idea of radiomen and any other mechanic or organization servicing refrigerators and we have come to the conclusion that in order to fill in the winter slump, we are going after servicing by contract, on a yearly basis for a stipulated sum, so that a steady income will be assured us during the winter months. This will cover all types of refrigeration. Also we have been approached by manufacturer and distributor organizations in lieu of installation and service work by yearly contract. We believe that if all refrigeration service organizations will stay in their respective field, their reputation will be more respected, and it will not be long when the independent service men will be doing a great deal of the manufacturer's installing and servicing thereby assuring a steady income, and for that reason I would prefer to stay in the one field, and deliver Service that Serves.

"I have no available figures or even a remote idea of the approximate volume of business being done by either organization, but will say that the Independent man is gaining as the time goes on, and we do know that every customer that discontinues dealing with the manufacturer or distributor organizations, looks forward to the Independent Service company to do their servicing, and from there on it depends on the business like manner in which you handle the service work.

"As a general summary I think that the Independent Refrigeration service business will develop into a sizable business, and with the proper guidance of those in this business, a respectable and paying business."

HOUSEHOLD REFRIGERANTS

SULPHUR dioxide is the refrigerant that is used in more than 75% of modern domestic or household systems. For household refrigeration, where the small charge used involves at worst a small hazard, sulphur dioxide still remains the favorite of designers. Freon and methyl chloride originally advocated for this use has not been used to any great extent by comparison. Some of the other mediums used in household systems are given in the following list:

Refrigerant	Chemical Symbol	Pressure in evaporator at 5° F. Saturation
Sulphur Dioxide	SO_2	6"
Methyl Chloride	CH_3CL	7#
Dichloro-difluoro methane or Freon (F-12)	CCL_2F_2	12#
Dichlorotetra fluoroethane (F114)	C_2CL_2F	16"
Isobutane (Freezol)	$(CH_3)_3CH$	8"
Ethyl Chloride	C_2H_5CL	20"
Methylene Chloride (Dichloromethane) Carrene	CH_2CL_2	27.1"

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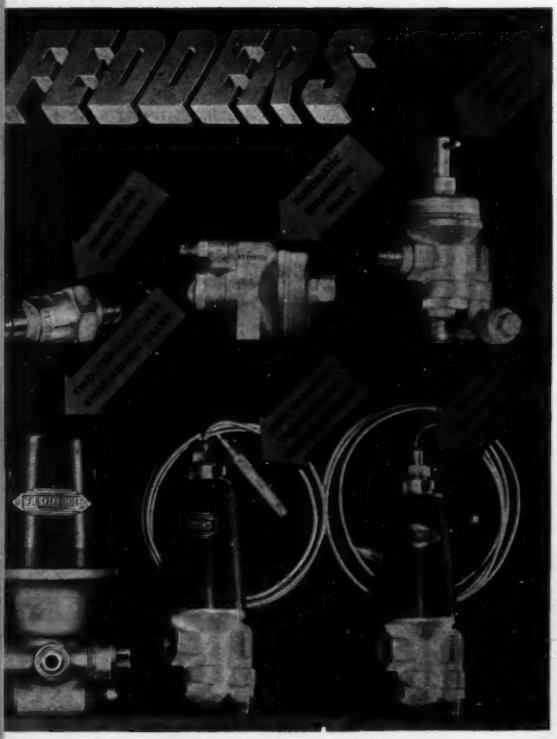

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Superintendent, Electric Refrigeration Division

Fedders Complete Line of Low Side Appliances

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Haralson Sales, Inc.

BOSTON, (CAMBRIDGE) MASS.
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BUFFALO, N. Y.
Fedders Manufacturing Co.
Root-Neal & Co.

CHICAGO, ILL.
Fedders Manufacturing Co.
Harry Alter Supply Co.
H. W. Blythe Co.
George Monjian Co.
Utilities Engineering Sales Co.

CINCINNATI, OHIO
Fedders Manufacturing Co.
Merkel Brothers Co.

CLEVELAND, OHIO
Debes & Company

DALLAS, TEXAS
Fedders Manufacturing Co.
Beckett Electric Co.

DENVER, COLO.
Auto Equipment Company

DETROIT, MICH.
W. C. DuComb Company

FERNWOOD, MISS.
Enochs Sales Company

GREENSBORO, N. C.
Home Appliance Service Co.

HOUSTON, TEXAS
Walter Refrigeration Supply Co.
D. C. Lingo Company

KANSAS CITY, MO.
Natkin & Company

LONG BEACH, CALIF.
Allied Refrigeration

LOS ANGELES, CALIF.
Franklin G. Slagel

MINNEAPOLIS, MINN.
Refrigeration & Industrial Supply Co.

NEW ORLEANS, LA.
Enoch Sales Co.

NEW YORK CITY
Fedders Manufacturing Co.
Melchior, Armstrong, Dessau Co.

PHILADELPHIA, PA.
Melchior, Armstrong, Dessau Co.

PHOENIX, ARIZ.
R. R. Reynolds Co.

PITTSBURGH, PA.
William M. Orr Co.

PORTLAND, ORE.
Stone Supply Co.
Refrigerative Supply Inc.
Refrigerating & Power Specialties Co.

SAN FRANCISCO, CALIF.
California Refrigerator Co.
Refrigeration & Power Specialties Co.

SEATTLE, WASH.
Refrigerative Supply Inc.
Refrigerating & Power Specialties Co.

SPOKANE, WASH.
E. S. Matthews, Inc.
Refrigeration Parts Supply Co.

ST. LOUIS, MO.
The Spangler Company

VANCOUVER, B. C.
Fleck Bros., Ltd.
Marshall-Wells B. C. Limited

TURING CO., BUFFALO, N.Y.

383 Cincinnati 209 S. Pearl St., Dallas 923 E. 3rd St., Los Angeles

THE Question BOX

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.

THE following questions submitted to this department are answered by Mr. George H. Clark, chairman National Educational and Examining Board, Refrigeration Service Engineers Society.

Have any readers other opinions regarding the problems involved. Send them to the Editor.

Xylene

Question 67. This spring, we have heard quite a bit around here regarding putting about four ounces of Xylene in the crankcase of the compressor to cure seal squeaks. Can you give us the low-down on this practice or is it something new? It is the first I have heard of it. What is its effect on SO_2 gas?

ANSWER: We publish an excerpt from a report issued November 15, 1934, by E. I. du Pont de Nemours & Co., Inc.

"While we have had no experience with the use of Xylene in the above connection, we would venture the opinion that it can be used satisfactorily for cleaning sludge deposits and oil from sulphur dioxide systems when overhauling. Off-hand, it would appear that Xylene would be of little or no help in drying, as water does not dissolve in it. Its use should be followed by the usual drying procedure with alcohol. We are not able to venture an opinion as to the effects of operating a sulphur dioxide system with appreciable quantities of Xylene present."

Servel Oil Charge

Question 68. Will you please advise me the amount of oil used in the Servel hermetically sealed unit and the recommended gas charge?

ANSWER: On Servel hermetically sealed units we submit the following as being correct amounts for oil and gas charge:

No. 10 Series Unit, 380 C.C. oil charge, or approximately 13 oz.

No. 15C Series Unit, 650 C.C. oil charge, or approximately 22 oz.

No. 15 Series Unit, 750 C.C. oil charge, or approximately 26 oz.

No. 10 Series Unit, 16 oz. of methyl chloride gas.

No. 15 Series Unit, 34 oz. of methyl chloride gas.

One C.C., or cubic centimeter, is equivalent to 1/30 of an ounce.

Charging Old Servel

Question 69. I am having trouble charging an old Servel using a pressure control. The unit was made in 1927. Can you tell me the best way to charge this unit?

ANSWER: I imagine your difficulty in charging resolves itself into a question of what charge to use as the refrigerant may be drawn into the suction side or charged as a liquid in the high-side as in any other system.

The old domestic systems with high-side floats usually take a complete charge of 2½ lbs. of methyl chloride.

Be sure system is free of air. Also, refrigerant in high-side valve cannot be pumped down as in other type systems unless float valve is turned upside down during the operation. To insure system is free from air, stop machine and purge from top of high-side float valve after system is charged, by removing or loosening the plug in the top of the float chamber. Be careful not to lose too much refrigerant at the same time.

Also, float valve may be giving trouble by not closing tightly with low refrigerant level in chamber. If so, this should be repaired or replaced. In a good many cases, an expansion valve and temperature control may be used to replace the high-side float and pressure control.

Leonard Oil Binding

Question 70. I have been having some complaint from 1934 Leonard users about a

noise in their refrigerators. I have never heard it, but have had it explained to me. It only occurs occasionally, mostly at night.

It starts way down at the bottom of the liquid line with a low "sho o o o" and gradually increases with a gurgling and pounding, getting louder and louder and going up higher and higher and finally getting up into the cooling unit and stopping there with a loud report. Others say it does not get so loud, but continues during a cycle of the machine. Outside of the noise, these machines work perfectly and otherwise operate quietly. Pressures seem to be perfect. I am at a loss as to what to do to stop it.

ANSWER: I believe that the trouble in connection with the 1934 Leonard which you describe is caused by an oil-bound condition in the high-side float assembly; that is, the oil displaces the liquid refrigerant in the receiver and has too low a density to give the float enough buoyancy to open and feed the refrigerant through into the evaporator. Probably the oil is mixed with a greater quantity of liquid refrigerant as the machine operates and more refrigerant is condensed and stored in the liquid receiver. As sufficient refrigerant is condensed and stored in the receiver, the float ball is buoyed up and the valve opens, allowing the refrigerant and oil to pass from the high-side float chamber through the pressure-reducing valve and into the evaporator. Probably the best remedy for this situation would be to replace the present receiver and high-side float valve assembly with another assembly in which the float ball was sufficiently large to float in oil so that there can be no possibility of building up a quantity of oil in the receiver and then shooting it over into the evaporator all at once, as may happen in the case described above. It is possible also that removing a small quantity of oil from the system may help in the solution of this problem.

Bottle Cooler Hookup

Question 71. A customer of mine has a Kelvinator bottle cooler to which he wants to add a small tank for cooling pop. The proposed tank would be 14"x20½"x14½" deep inside.

The tank on the bottle cooler is 20"x40"x 14½" deep inside. This unit uses a Kelvinator condensing unit, Part No. 48025, Serial No. 1161417. The evaporator consists of 50 feet of ⅜" copper tubing in the bottom of the tank. The coils are submerged in water, which comes to the bottom of the labels on the bottles.

This unit uses a high-side float below the box, and a pressure-reducing valve in the bottle box. A Cutler-Hammer thermostat is used for motor control.

Please advise me as to the proper installation to make to cool the small tank for pop. Could this be connected to the coil already in the large tank, without making any adjustments on the high-side float, or would it be necessary to use an individual float and reducing valve for the smaller tank?

Please advise me as to how many feet of coil I should use in the small box.

ANSWER: Use about 15 to 20 feet of ⅜" tubing for your smaller cooler. Connect outlet of high-side float valve to new cooler. Connect outlet of high-side float valve to new coil and outlet of new coil to inlet of old coil. If tube is exposed between coils, cover with thick insulating tube in exposed portion. ¼ to ½ lb. of SO_2 may have to be added to the system. Judge refrigerant supply by flood back. If coil floods back to compressor, remove a small quantity and try again. If only part of second coil cools, add small quantity of SO_2 to system. No float valve adjustments will be required. High-side floats are not suitable for multiple hookup. The pressure-reducing valve should be installed at the inlet of the first cooling coil on the line, in the above case, at the beginning of the new coil. Leave thermostat connected as at present.

(Continued on Page 36)

S S S

H. J. Dickinson, New York.

Am today in receipt of the specimen copy of the REFRIGERATION SERVICE ENGINEER. A wealth of knowledge is contained therein and the organ is a great credit to the Society which it represents. Doubtless by this time you have my subscription on file.

Kenneth Woundy, New Jersey.

Enclosed is check for $2.00 for my 1935 subscription to the REFRIGERATION SERVICE ENGINEER. I find this a most satisfactory publication and it has been of considerable interest and assistance, both to my service men and myself.

Facts About Freon *(2nd Article)*

Piston Displacement—Pressures—Gravity —Density—Lubrication—Horse-Power— Filtration—Drying Units, etc.

By
R. J. THOMPSON*

CORRECTION IN APRIL ISSUE

On page 5, April, 1935, issue under the sub-head Toxicity, third paragraph, sixth line should read as follows: "In tests with concentrations of the order of 28.5 to 30.4%, etc."

Piston Displacement

Regardless of the fact that Freon has a low B.t.u. refrigerating effect per pound or less than 1/9th that of ammonia, which has the highest B.t.u. refrigerating effect, the piston displacement of a Freon compressor is only 69% greater. The B.t.u. effect of Freon is approximately 1/3rd that of methylene chloride, sulphur dioxide, or methyl chloride, or ¼th that of methyl formate, although the Freon compressor has a displacement of 92%, 86%, 5% or 89% less, respectively.

The volume per pound of the refrigerant vapor, together with the B.t.u. refrigerating effect determines the piston displacement, and since Freon has a very low volume per pound of vapor, the comparatively low heat value is compensated. The piston displacement of 5.815 cubic feet per minute per standard ton is only one of many factors in determining the design of refrigeration apparatus.

It is possible to use present equipment in many cases provided proper cognizance is given to the new B.t.u. capacity, piston displacement, pressure control mechanism, regulating valve orifice size, lubrication, and gas velocity.

A curve was recently prepared which plots cubic feet piston displacement against boiling point of refrigerant. Strangely enough, these points produce a very uniform curve which may be used for predicting displacements when boiling point is known.

* Kinetic Chemicals, Inc.

Quantity of Refrigerant

A refrigerant must not be judged only by the fact that it has a high or low refrigerating effect per pound but the volume per pound of the liquid refrigerant must also be taken into account.

While Freon has a relatively low refrigerating effect, this is not a disadvantage as it merely indicates that greater volumes of liquid must be circulated to produce the desired amount of refrigeration. Actually, it is a decided advantage to circulate large quantities or at greater speed as the greater volume or speed will permit the use of less sensitive, more accurate and more positive operating and regulating mechanisms with less critical adjustment.

Head Pressures

Operating head pressures will vary with the temperature of the condensing medium, whether an air or water cooled condenser is used, and operating back pressure. Within the wide range of Freon application this operating head pressure in pounds per square inch gage may be closely approximated by multiplying the temperature of condensing medium in degrees Fahrenheit by a head pressure factor of 1¼ to 2, depending upon the three conditions just mentioned. For example, let us assume an air cooled household unit in a 70° kitchen, operating with a 20 lb. back pressure (average 18° evaporator). This factor will be 1.77. 70 times 1.77 equals 124, so that the operating head pressure will be 120 to 125 lbs. gage.

Freon may be used in either air cooled or water cooled compressors, due to relatively low horsepower and exceedingly low compression temperatures. The low temperature of adiabatic compression of Freon is 109.5° F. (standard ton conditions), thus requiring less condensing surface for the removal of superheat than is needed for other refrigerants now in common use.

Back Pressures

Freon charged compressors operate at low but positive back pressure down to approximately —20° F., which permit of high volumetric efficiency. Positive pressure prevents moisture laden air from accidentally entering the system, which would reduce the coefficient of performance by the air lodging in the condenser and cause high head pressures and temperatures, and also cause the moisture to freeze out as ice and interfere with the normal operation of the liquid regulating valve.

Positive pressures permit of testing and locating a leak as it is difficult to locate a leak when the apparatus is operating at negative pressure. It is believed that outward leaks of a refrigerant are better than inward leaks of air, assuming of course that the refrigerant is non-toxic, non-irritating, non-flammable, non-explosive, non-injurious to foods, or is one which will not cause a health, fire, panic, or property damage hazard.

Gravity

Since the specific gravity of Freon liquid is from 1½ to 2½ times greater than that of other commonly used refrigerants, with the exception of sulphur dioxide, the float valve ball must be designed of the proper weight and buoyancy to positively control the flow of refrigerant through the regulating valve.

Density

Saturated Freon vapor at 5° F. is much more dense than other compressor gases used as refrigerants, with the exception of carbon dioxide, with the result that the Freon gas velocity must be reduced so as to avoid excessive pressure drops. All restrictions to the free passage of Freon vapor should be eliminated or reduced in order to obtain maximum operating efficiency. This will undoubtedly call for the redesigning of intake, discharge, and service valves to provide increased opening. A close study should be given to pressure volume diagram.

Density, viscosity, thermal conductivity, Reynolds' number, etc., should be the foundation of good engineering design, but in addition such factors as solvent action of the refrigerant on the oil, greases, binder, oxides, surface wetting characteristics, methods of manifolding, and many others must be taken into account, none of which must be overlooked or disregarded.

Lubrication

The lubrication of a Freon charged compressor is similar to that of a compressor using a hydrocarbon refrigerant such as methyl chloride, ethyl chloride, isobutane, or methylene chloride, which are completely miscible with mineral lubricating oil.

The lubricant used with Freon charged compressors should be a straight run and properly refined mineral oil and obviously must not contain water, sediment, acid, soap, resin, or any substance not derived from petroleum, and must not form wax or gum in the presence of Freon. All of the oil refining companies are in position to supply mineral lubricating oil of the proper characteristics and quality.

Freon absorbs small quantities of mineral oil, depending upon the oil characteristics, temperature of the oil in the crank case, and operating back pressures, but unlike refrigerants other than the hydrocarbon refrigerants, does not deposit the lubricating oil in the low side of the system.

The use of glycerin or ethylene glycol is not recommended as those compounds are highly hygroscopic and, in addition, have a tendency to become gummy or produce a sticky sludge on surfaces when the compressor or system is idle or when the lubricant is heated. It is my belief that miscibility with positive oil return and foaming of oil is to be preferred to immiscibility with oil logging.

Horse Power

The horse power per standard ton of refrigeration is substantially the same for all refrigerants with the exception of carbon dioxide. Mother Nature provided that we cannot get something for nothing, and to obtain a certain amount of work there must be expended a very definite amount of energy. It is interesting to note that the theoretical horse power of Freon is .959, sulphur dioxide—.980, methyl chloride—.970, and ammonia—.979.

Filtration

Freon, being an excellent solvent, has the ability of dissolving, loosening and physically

removing all factory dirt, oxides, scale, soldering flux, factory washing compounds, etc., that may be in a system, and cause the foreign matter to be removed by the liquid or vapor Freon and deposit the heavy particles or corrosion products at the strainer or filter and close the system. Filters of fine mesh screen of sufficient area to prevent blocking in a short time should be provided and so designed as to be readily disassembled to permit cleaning.

Detecting Leaks

A Freon leak may be detected by means of a halide lamp. Owing to the breaking down of the refrigerant in the flame, a volatile copper halide is formed and the flame color changes from the normal colorless one to a bright green if the air contains as much as .01% of Freon. Such a leak is equivalent to the escaping of Freon at the rate of 1 oz. of liquid per month, or ¾ lbs. per year.

Freon is not as difficult to hold as other compressed gases used as refrigerants, when under the same pressure. The leak of a gas or vapor from a system is inversely proportional to the square root of its molecular weight. Freon has a molecular weight of 120.9 as compared with sulphur dioxide—64.07, methyl chloride—50.48, ammonia—17.03, and air—29.0.

Drying Units

Moisture must be removed from Freon systems to prevent formation of ice crystals at the regulating valve, prevent oxidation, and prevent intercrystalline embrittlement of brasses when under cyclic stress. This moisture may be removed by heating and evacuating the units (household size), as has been the practice throughout the industry for years, or by the proper use of a drying agent such as silica gel or activated alumina.

When oven equipment is not available, we recommend that activated silica gel or activated alumina dryers be used in the liquid line as they have good absorption capacity and no new compounds will be formed when an amount of water in excess of the absorption capacity is present.

We do not recommend the use of calcium chloride as the cartridges invariably are too small in absorption capacity and a brine is formed which will play havoc with the entire system. When excessive moisture is present calcium oxide hydrates to calcium hydroxide and finely divided material is removed from the cartridge by the velocity of the Freon liquid and is deposited through the system.

Moisture absorption is influenced by temperature, moisture, rate of flow, size of activated absorbent capacity for absorbing moisture, and size of equipment.

The miscibility of water in Freon is low and is in the order of .006% by weight at 32° F. and .015% at 77° F.

Handling Freon

It is not necessary to use a gas mask when handling Freon, since it is non-toxic, but large lensed spectacles should be worn to prevent liquid Freon from freezing the moisture in the eyes.

Should liquid Freon come in contact with the eyes, the person suffering the injury should be taken at once to a good eye specialist, avoid rubbing, and should be given the following first-aid treatment: Irrigate the eye with sterile oil, and after irrigation continue to wash with either a weak boric acid or sterile salt solution not to exceed 2% sodium chloride.

REPAIRING A SEAL LEAK

A SEAL leak is usually caused by corrosion or dirt getting between the surfaces of the seal. It is usually better to replace the seal and shaft, although slight leaks can usually be stopped by lapping the surfaces. To polish the surfaces, the crankcase must be evacuated. The flywheel and seal must be removed and a mixture of powdered bon-ami and oil placed on the face of the seal. Replace the flywheel and seal, and turn the flywheel by hand forward and backward until the surfaces are smooth, or by using a lapping block. Remove the flywheel and seal, and carefully clean seal and cavity with carbon tetrachloride. Then, replace on compressor.

To test a seal bellows for leaks, place the seal downward on a flat piece of rubber and fill the bellows full of gasoline. If a seal surface is badly scored, either a new shaft must be placed in, or an old one put in the lathe and polished with a grinding wheel.

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

A HEALTHY GROWTH

IN this issue is published an article, pointing out the recent trends in the growth of servicing organizations, which has occurred during the past few years. This expansion can be attributed to several important factors which assure the future of the servicing business.

One in particular, we believe, is worthy of mention at this time, and we are equally confident is recognized by the men engaged in this business—that is, the part played by the manufacturer of refrigeration appliances, accessories and replacement parts and his jobber.

A call for refrigeration servicing is usually an urgent one. In many cases, such a call is not received until a breakdown of the plant occurs. No time can be lost. One of the cardinal principles of the service business is prompt attention. This is particularly true in the matter of commercial servicing, where many hundreds of dollars of perishables are at stake.

The manufacturer, recognizing this condition, has spent much time and money in the preparation of bulletins and catalogs to bring to the shop of every service organization, as complete and practical information as is possible, so that unnecessary delay may be eliminated.

Realizing that in some cases even prompt over-night service was not fast enough, manufacturers sought to improve their facilities. As a consequence, there came into being, as in other well-organized industries, the refrigeration parts jobber, who served his community requirements within a certain radius. These jobbing connections have shown a rapid increase in a comparatively short time, and today are located at strategic distributing centers. Considerable investment has been made in these warehouses of refrigeration appliances, where usually a complete stock of materials and equipment is available for the requirements of the service man. It is this cooperation of manufacturer and jobber which has contributed in no small measure to the ability of the service man to render to his clientele, the type of service that this industry demands.

Another important factor that must be considered is the valuable information that has been developed by the engineering departments of these organizations, for the benefit of the service business. From these engineering laboratories has come a wealth of information.

SPECIALIZATION

THE REFRIGERATION SERVICE ENGINEER has advocated, in past issues, the consideration of the possibilities of some companion service business to fill in the off-peak season.

During the coming refrigeration months, this question, of course, will be of no great concern, but of course "bobs up" as soon as the demand for servicing lessens.

It has been gratifying to learn that many refrigeration service men, recognizing this business as one of specialization, have hesitated to adopt other allied lines, but rather have endeavored to build up a demand for commercial servicing and other contract work that will develop into a worthwhile business during the usual off-season periods.

We have been interested in learning that many representative organizations have been successful in their efforts in this direction. Possibly, with the many developments of the refrigeration business, servicing in the future will not experience the uneven line of activity it now represents.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

Pittsburgh Service Men Apply to National Society for Charter

ON March 18th, service men of Pittsburgh and vicinity met at the Allegheny Vocational School to consider the formation of a local chapter.

Mr. F. W. Golitz, an instructor in the school, welcomed the gathering and turned the meeting over to National Secretary, H. T. McDermott, who spoke at length on the aims, policies and purposes of the Society. Following this talk, the advantages of such an organization were stressed by a number of those present and upon motion it was decided to form a local organization.

To carry out the work of the organization, temporary officers were elected consisting of Roy A. Mall, president; S. F. Gibson, secretary, and John Kane, treasurer.

The formal petition for a chapter was circulated and signed by twenty-eight of those present.

Meeting of March 25

This meeting was held in the Allegheny Vocational School with Temporary President, Roy Mall, presiding. Mr. Mall read sections of the constitution and by-laws, which have been adopted for the guidance of local chapters, and which are in conformity with the National By-Laws. A discussion of these by-laws followed.

Mr. Clause talked of the needs of the independent service men. Mr. Kirch discussed the need of a Credit Bureau for service men.

Mr. Ben Stern invited the group to make use of the facilities of the Kramer Auto Radiator Company for their next meeting. It was moved by Mr. Kirch and seconded by Mr. Yagisch that the April 9 meeting be held at the offices of this company.

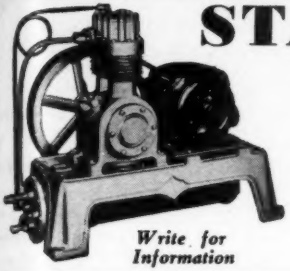
Twenty applications for membership were received, and initiation fees paid to the Treasurer.

Meeting of April 9

This meeting was held in the offices of the Kramer Auto Radiator Company, 5114 Liberty Avenue, with Temporary President, Roy Mall, presiding.

In the absence of Mr. Gibson, secretary, the meeting was opened for general discussion, and information was given to prospec-

SECOND ANNUAL CONVENTION
OCTOBER 23-24-25, DETROIT, MICH.



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tive members regarding the objects of the Refrigeration Service Engineers' Society.

It was moved by Mr. McCloud and seconded by Mr. Ricci that the next meeting on Tuesday, April 23, be held in the same place, and that permanent officers of Pittsburgh Chapter be elected.

Six applications for membership were received, and initiation fees paid to the Treasurer.

Meeting of April 23

Due to the absence of Temporary President, Roy Mall, the Secretary, Mr. Gibson, presided, and upon motion made by Mr. Kirch and seconded by Mr. Black, the regular order of business was dispensed with so that the election of permanent officers could be held.

The election resulted in the following officers being elected:

President—C. O. McCauley, 405 Penn Ave., Pittsburgh, Pa.

Vice-President—E. Vernon Black, 342 Braddock Ave., Uniontown, Pa.

Secretary—F. V. Golitz, 1518 Davis Ave., Pittsburgh, Pa.

Treasurer—John Kane, 105 Steuben St., Pittsburgh, Pa.

Mr. McCauley outlined some of the plans of Pittsburgh Chapter, and the members entered into a general discussion on mutual problems.

It was moved by Mr. McCloud and seconded by Mr. Barnes that a committee be appointed to draft a set of by-laws to be presented for correction and approval at the next meeting. Mr. McCauley appointed in addition to the four officers, the following members: Messrs. Kirch, Barnes and McCloud.

It was moved by Mr. Barnes and seconded by Mr. Gunnell that the Secretary notify the National office that the tentative by-laws had been adopted for Pittsburgh Chapter.

Ten applications for membership were received and initiation fees paid to the Treasurer.

* * *

Harry G. Weiss, Missouri.

I have been a subscriber to your magazine since March, 1934, and have found much valuable information in each issue. I would like to procure the back numbers.

YOUNGSTOWN CHAPTER RECEIVES ITS CHARTER

By Roy E. Keith, Secretary

Meeting of March 20, 1935

PRESIDENT Sanders opened the meeting, after a fine dinner at the Tokio Inn, and the Secretary's report of the minutes of the last meeting were read and approved.

Gene Kreitsburg, Milford W. Remaly and W. R. Beggs were taken in as new members.

Mr. King gave us a fine talk on what he expects to do toward the educational program, and expects us all to read and study up on Lecture No. 2 for a discussion of it at the next meeting.

President Sanders verified this program, and Mr. King then gave us a very fine speech, introducing Mr. McDermott, National Secretary, and Mr. McDermott responded with a very interesting talk on what the National Society is doing for each Chapter and ended up by giving us all the oath of the Refrigeration Service Engineers' Society, and then presented the charter to President Sanders for safekeeping, and the Youngstown Chapter No. 1 of the R. S. E. S. was officially formed.

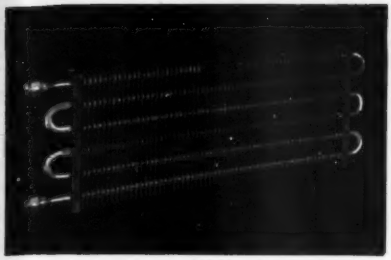
Election of officers was then in order. Mr. Chas. P. Eich was unanimously elected president. President Eich took charge of the meeting at once. E. W. VanCise was unanimously elected for vice-president; Mr. Roy Keith was elected secretary; Mr. Martin Bokesch was elected for treasurer; Reese Davies was unanimously elected sergeant-at-arms. The election of the directors was next in order. Mr. Butler, Mr. Wright and Mr. Nutt were elected to this office, and the Board of Directors is composed of all the elected officers and these three.

A motion was made and seconded to have our meeting nights on the 1st and 3rd Mondays of each month.

At this point of the meeting, our President received a very sad message of the death of his father, and all of us were very deeply affected.

Meeting of April 1st

WITH President Eich presiding, the usual routine business was transacted. The Board of Directors presented their report.



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A motion by M. Bokesch, to assess each member fifty cents a month for a reserve fund, was duly seconded and carried. Also, to secure the emblem of the Society for the printing of letterheads for the Chapter.

The arrangement to have special speakers at each meeting was discussed.

The meeting was then turned over to our educational chairman, Mr. King, who led the discussion on Lecture No. 2 as well as reviewing Lession No. 1.

Meeting of April 15

The usual business of the meeting being disposed of, President Eich appointed Secretary Keith to contact the Professor of Youngstown College to ascertain if he would attend the meeting of May 6th to give a talk on refrigeration and gases.

The meeting was then turned over to Mr. King, who delegated Mr. E. Wright to conduct the educational program of the meeting, which was based on Lecture No. 1 issued by the National Headquarters.

KANSAS CITY CHAPTER

By C. F. Ramey, Secretary

Meeting of April 30

TEMPORARY President Leitner called the meeting to order, and proceeding with the usual order of business the President explained the requirements of the National Society in the granting of the charter as a constituent body of the National organization.

In view of the notification by the National Society that the charter had been granted to Kansas City, the Chapter proceeded with the election of permanent officers. The election resulted as follows:

President—S. A. Leitner.

First Vice-president—Roy F. Cox.

Second Vice-president—H. L. Green.

Secretary—C. F. Ramey.

Treasurer—Jane Merritt.

Sergeant-at-Arms—F. E. Furlow.

Board of Directors—D. D. Pollock, R. T. Ransdell, W. R. Jones.

For chairman of the Educational Committee Mr. W. R. Jones was elected. The Chapter is now making preparations for the charter meeting night, and service men located in the vicinity of Kansas City are invited to communicate with the Secretary regarding membership. Address C. F. Ramey, 4322 Flora Ave., Kansas City, Mo.

CHICAGO CHAPTER

By H. D. Busby, Secretary

Meeting of April 23

PRESIDENT JACOBSEN disposed of the business of the meeting in the usual manner and advised the members that we were glad to have as guests of the evening, Mr. Lester Larkin of the Larkin Refrigerating Corp. of Atlanta, Georgia, and Mr. Joiner of the Western Sales Corp., Chicago.

Mr. Larkin gave a very interesting talk on the development of refrigeration coils and his early days in the refrigeration field, and spoke also of the development of the various coils now manufactured by his company.

Following Mr. Larkin's talk, the educational program of the evening was a prepared paper by John Northcote on the servicing of the Kelvinator "Wonder" Model of 1932. Mr. Northcote gave a most excellent talk on the actual servicing of this machine.

CLEVELAND CHAPTER RECEIVES CHARTER

By K. P. Wall, Secretary

Meeting of March 22

PRESIDENT Warren Farr presided at the meeting on the occasion of the receipt of our charter from the National Society.

After a brief introduction and the announcement of the purpose of the meeting, President Farr turned the meeting over to our National Secretary, H. T. McDermott.

Mr. McDermott prefaced the presentation of the charter by a speech in which he elaborated on the ideals of the society, and then administered the oath to the 30 members present.

The charter was then presented to President Farr, who thanked our National Secretary on behalf of Cleveland Chapter.

We then had a general discussion in which Mr. McDermott answered the questions of many of our members.

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122 W. Illinois St., CHICAGO

DEHYDRA-TECTOR

The Dryer with the Liquid Sight Port

● Sight Port shows if system has sufficient refrigerant. Dispersion Tube assures even distribution of refrigerant through the dehydrant. Minimum pressure drop. Maximum drying efficiency and capacity. Easily dismantled and assembled for cleaning and refilling. Gasketed screw end caps make up gas-tight tongue and groove joints. Soldering not necessary. Retaining spring compensates for expansion or contraction of dehydrant. Pad and screen assembly is anchored in end cap. Any dehydrant can be supplied.

● Henry Dehydrators, Strainers and Service Tools, have new features of construction.

Write for Bulletins

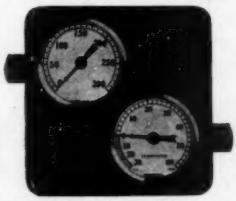
HENRY VALVE CO.
1003-21 N. Spaulding Ave.
Chicago, Ill.

(Cross-sectional view)

The *SIAMESE Test Gauge*

FOR HOUSEHOLD REFRIGERATING MACHINES

Accurate . . Compact . . Durable



Supplied in Leatheroid Case

Especially designed for the service man's tool kit.
Non-breakable crystals.
Pointer easily reset by removing snap cover and turning dial to proper position.

Carried by Leading Jobbers

MARSHALLTOWN MFG. CO.
MARSHALLTOWN - - IOWA

AKRON CHAPTER

By Charles Hall, Secretary

Meeting of May 2

THE meeting of Akron Chapter was held at 120 Ash St., with President Wall presiding. We were indeed pleased to have four of the members of Cleveland Chapter present, including President Farr, Mr. Metzler, Mr. Gardella and Mr. Schuld.

It was a good meeting, and we had a general round-table discussion of the servicing business, in which all participated in the exchange of ideas.

Messrs. Brett and Stewart suggested that we elect Mr. Yoder to honorary membership.

One new application for membership, recommended by Secretary Hall was presented.

Meetings of Akron Chapter are held on the first and third Tuesdays of each month, and we invite service engineers in the vicinity of Akron to communicate with the Secretary at either of the following phones: shop, JE-0338; residence, BL-5552.

NEW MECHANICAL DEVICES
Service Tools and Special Equipment

Under this heading there will be published illustrated descriptions of new or improved service tools and equipment for the Service Engineer.

THE HENRY DEHYDRA-TECTOR

THE combination of a Dehydrator and Liquid flow Indicator, built into a single compact unit, has brought new convenience to refrigeration service engineers everywhere.

This product, more commonly known as the Henry Dehydra-Tector, has been on the market approximately two years. Yet in this short time, due to exclusive features of design and performance in the field, it has become established as a standard item of equipment with service engineers.

The liquid sight port indicates instantly if a system has sufficient refrigerant. If a shortage exists, this fact is made known by the presence of small bubbles of gas which pass under the liquid sight glass.

CROSS-SECTIONAL VIEW OF DEHYDRA-TECTOR WITH DISPERSION TUBE

The dispersion tube, connected to the inlet port, exposes the entire volume of dehydrant to penetration by the refrigerant and reduces pressure drop. This accounts for the increased efficiency rendered by this type of dryer according to the Henry Valve Company, manufacturers. The dehydrant in this unit, which is illustrated, is retained under spring tension to compensate for its variation in volume due to expansion or contraction. This is of particular advantage when a soluble drying agent is used. Gasketed screw end caps produce gas-tight tongue and groove joints and facilitate dismantling and refilling.

Dehydra-Tectors are available without dispersion tubes, having filter pad and screen assemblies locked in position in both end caps by means of spring rings. The Henry Valve Company, Chicago, Ill., manufacture a complete line of Dehydrators which are identical with the Dehydra-Tectors except that liquid sight ports are eliminated. These various types of dryers can be supplied either unfilled or furnished with an initial charge of any one of the four following dehydrants: activated alumina, anhydrous porous calcium chloride, calcium oxide, or soda lime. A new bulletin describing Henry Dehydra-Tectors and Dehydrators will be mailed to any one interested.

S S S

J. H. Starr, Illinois.

I have been in the servicing business for some time. I thought I was pretty well versed in all refrigeration work, but after reading each issue of the Service Engineer, I find that there is plenty yet to learn.

BAKER REFRIGERATION

Baker Specializes in All Types of
REFRIGERATION and AIR CONDITIONING

For thirty years Baker has been recognized as a leader in the manufacture, engineering, and installation of refrigerating equipment. Precision built and designed for long life and operating economy, Baker's complete line includes:

COMPRESSORS (Freon, Methyl-Chloride and Ammonia)
COMPLETE AUTOMATIC UNITS
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BAUDELOT TYPE COOLERS
HORIZONTAL MULTI-UNIT CONDENSERS
ATMOSPHERIC CONDENSERS (All Types)
AUTOMATIC CONTROL and Accessories
COOLING TOWERS
SPRAY PONDS
FORCED DRAFT COOLING UNITS
COOLING COILS (All Types)
VALVES AND FITTINGS (All Sizes)

Baker Sales and Service in Principal Cities

Quick service on a national scale is available for your needs through Baker's sales and engineering staff at these points:

Albuquerque, Baltimore, Boston, Chicago, Dallas, Denver, Des Moines, Ft. Worth, Kansas City, Little Rock, Los Angeles, Minneapolis, New York City, Oakland, Oklahoma City, Pittsburgh, Rochester, San Antonio, Seattle, St. Louis, Salt Lake City, So. Norwalk, Conn., Tulsa, Washington, D. C.

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KRUPP WATER REGULATOR STYLE "F"

for Methyl-Freon-Sulphur

A regulator featuring elimination of the stuffing box. Water valve body is made of cast bronze and has renewable rubber composition seat; noiseless in operation; the frame is so designed that adjustments can be made easily.

Bulletins and prices upon request.

CYRUS SHANK CO.
625-631 W. Jackson Blvd.
CHICAGO, ILL.
Manufacturers of Krupp Valves for Mechanical Refrigeration

QUESTIONS AND ANSWERS

(Continued from page 23)

Eliminating G. E. Oil and Air Binding

Question 72. *I have run into some difficulty which I would like your opinion on. It concerns a G.E. flat top unit with the unit on the top.*

The symptoms are: it will run normally for a few cycles and stop refrigerating, the compressor running continuously, with all the refrigerant pumped out of evaporator. At times if it stands a long period of time, it will work for several more cycles. I decided it was air in the float chamber. I purged a number of times without results so I discharged all refrigerant and refilled, without results. I have almost come to the conclusion that oil is getting into the float chamber which is not heavy enough to raise the float and does not let refrigerant into the evaporator. When I purge, it will start working every time.

ANSWER: From your description I take it that your guess that oil may be displacing refrigerant in the high-side float chamber may be correct. Either that, or a small low-side leak allows air to enter the system and causes the float valve to become "air bound."

As a very definite cure, I suggest you replace the present receiver and high-side float with a new high-side float contained in the receiver. Assure yourself that the new float will open with oil. This will thereby eliminate possibility of "air binding"—"oil binding," and will also eliminate possibility of a sticking float assembly.

BORG-WARNER IN PARTS BUSINESS

A COMPLETE line of parts and accessories for all makes of refrigeration and air conditioning units is now being sold by the Borg-Warner Service Parts Company, a division of Borg-Warner Corporation, according to an announcement by A. C. Darling, vice-president and general manager.

All parts and accessories for the new lines are now being stocked at the Borg-Warner warehouse, 121 East 21st Street, Chicago, and are available for rapid delivery.

Borg-Warner Service Parts Company has for many years been one of the leading sales organizations for genuine automotive replacement parts and maintains warehouses in thirteen principal cities throughout the country. The refrigeration and air conditioning parts and accessories will eventually be warehoused in each of the thirteen locations, Mr. Darling said, and will serve the trade on the same nation-wide basis that the automotive parts business is now conducted.

NEW WHEEL PULLER

A CHAIN wheel puller, designed especially for refrigeration work, has been placed on the market recently by the Servicemen Supply Co., 1819 Broadway, New York City, and can be supplied by refrigeration supply jobbers or direct.

The S. S. Co., chain puller, has been tried in the field for a period of two years. It quickly pulls flywheels of odd or even spokes of any number and shape. It can be used on shafts from the smallest up to 1 inch diameter. Total weight is 2¼ pounds. It can be used as a press to force "stuck-up" pistons out of the cylinder. It eliminates possible damage to pressed steel flywheels or a sprung shaft where a hammer has been used on an obstinate flywheel.

MELCHIOR, ARMSTRONG, DESSAU CO., INC., OPENS BALTIMORE BRANCH

OFFICES covering an entire floor of 8,000 square feet at 400 East Lombard Street, Baltimore, have been leased to Melchior, Armstrong, Dessau Co., Inc., for their new Baltimore Branch and Warehouse.

Mr. C. C. Storm, promotion manager of their home office in New York, will be in charge. Mr. Cecil Boling, previously engineer of the Boston Branch, will be the Baltimore Branch Manager.

The entire Southeastern Seaboard will be under the jurisdiction of the Baltimore Branch. Their present Southern salesmen—Messrs. Wright, Carlson, Travis, Booth and Bosarge, who formerly worked out of the

Philadelphia Branch, will now operate from Baltimore.

Melchior, Armstrong, Dessau Co., Inc., carry in New York, Baltimore, Philadelphia and in Boston, a complete assortment of Refrigeration Parts and Supplies, as well as large stocks of material for the Oil Burner and Heating Trades.

New Booklet Issued

A new booklet—Refriguide No. 1235—has recently been issued by the company, covering replacement parts for Frigidaire and Kelvinator compressors. This line is handled exclusively by them and we understand they would welcome inquiries from well established jobbers, as well as from dealers and service organizations throughout the country.

ALCO VALVE IS FROSTOFF SALES AGENTS

WILLIAM ILE, president of the Frostoff Company, Inc., 250 East 43rd Street, New York, N. Y., announces that the Alco Valve Company, Inc., 2630 Big Bend Blvd., St. Louis, Mo., have been appointed sales agents for the defrosting devices made by his company, and will be pleased to furnish all inquirers with full particulars and prices.

HAROLD R. REMPE, DECEASED

THE death of Harold R. Rempe, treasurer of the Rempe Co. of Chicago for the last twenty-three years, occurred Thursday, April 18, at his home, 132 North Parkside Ave., Chicago.

Mr. Rempe, who was a graduate of Notre Dame University, had been ill for over a year of a heart ailment. His early education was obtained in the public schools and Lewis Institute of Chicago.

Mr. Rempe was the son of the late George H. Rempe, who was the founder of the Rempe Co. Besides his wife and five children, he is survived by seven sisters and two brothers who were associated with him in the business. Funeral services were held Monday, April 22, at St. Catherine of Sienna Catholic Church.

FOR AIR CONDITIONING too!

V-METH-L VIRGINIA SMELTING

(Virginia Methyl Chloride, made by the makers of ESOTOO)

A PURE, efficient refrigerant ideally suited for use in the modern air-conditioning system — and for Ice Cream Cabinets, etc., as well.

Being refined and sold by the Virginia Smelting Company, its purity is assured; both moisture and acidity are reduced to the minimum.

Shipped in containers holding 1200, 90, 6 and 3½ lbs. Prompt deliveries from stock at 49 distributing points. For complete details, mail coupon.

Virginia Smelting Co.

West Norfolk, Virginia

RSE-5-35

MAIL-TO-DAY

F. A. EUSTIS, Sec'y,
VIRGINIA SMELTING CO.,
131 State St., Boston, Mass.

Send me the literature I have checked. I am interested in receiving any additional literature on Electrical Refrigeration you may issue from time to time.

- ☐ Folder: Extra Dry ESOTOO (Liquid Sulphur Dioxide)
- ☐ Folder: V-METH-L (Virginia Methyl Chloride)
- ☐ Folder: Transferring from large to small cylinders
- ☐ Circular: Physical properties of various refrigerants

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Household Refrigeration

FOURTH EDITION
700 PAGES
270 Illustrations

by H. B. Hull

A book every serviceman, salesman, and designer of household refrigerators, should have for ready reference

This New Edition Affords a Thorough and Practical Treatment of - - - - -

Refrigeration Principles, Units and Theory.

Food and Refrigeration—The results of many years of laboratory testing by one of the leading authorities on this subject.

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Thermodynamics—The relationships and applications of the science of thermodynamics and physical chemistry to refrigeration. Explanation of various cycles.

Heat Transmission—The fundamental laws regarding the transmission of heat and the application of these laws to refrigerator construction and the design of condensers, evaporators and other heat transfer apparatus.

Absorption Refrigerating Units—Principles and construction of household refrigerating units of the absorption type, including the recent developments in air cooling and use of solid absorbents.

Compression Type Refrigerating Systems—Specific data covering modern practice for designing the various units comprising household refrigerating systems. Detailed descriptions of the principles and operation of the many types of compressors, condensers, valves, controls and accessories as used by manufacturers of this equipment at the present time. Complete descriptions with photographs and construction details of the refrigerating systems, compressors and cabinets of the leading concerns in this industry.

Testing and Code Requirements—The method of testing refrigerators has lately been standardized and code requirements are of increasing importance. This edition contains full information on these subjects.

Air Conditioning—The fundamentals of air conditioning and the application of these principles to the office, residence and commercial establishment. Complete design data concerning unit conditioners.

Commercial Refrigerating Systems—Practical information regarding the use of small refrigerating machines in commercial establishments. The latest methods of cooling cases, counters and cold storage rooms.

NICKERSON & COLLINS COMPANY, PUBLISHERS, 435 N. Waller Avenue, Chicago, Ill.

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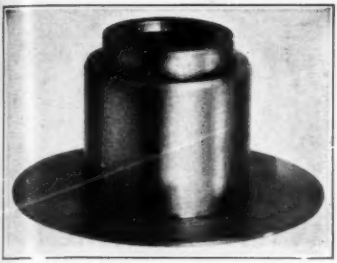

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This Karlberg, New Design, Compressor Seal Unit, is built to supply the need for a universal seal without soldering or fitting. Removable nose piece makes it possible to fit the seal to nearly any make or model of machine by merely inserting a longer or shorter seal nose piece. Available for either ½" or ⅝" shafts, or larger if specially ordered. Write today for prices and full information.

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The most convenient, surest and quickest means of detecting and locating Halide Gas Leaks in refrigeration units. An absolute necessity for the Service Engineer.

Positive, Instantaneous

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Improved burner design, "Y" suction tube and non-clogging feed valve make this the most effective Leak Detector. Recommended and now used by Halide Gas manufacturers, equipment manufacturers and service engineers everywhere. Low first cost and inexpensive operation.

Send for Detailed Description and New Low Price

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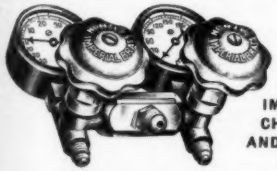
Shorter Work—Longer Service with IMPERIAL SERVICE TOOLS AND VALVES

ALL Imperial service tools are designed for faster and more expert work, and all valves and fittings are especially made for exacting refrigeration service.



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For removing refrigerants, testing for leaks, preparing for charging, etc. Equipped with Imperial "Sylpak" shutoff valves (operated on the sylphon principle).

200-C $6.75

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Makes a clean right-angle cut quickly and easily. For copper, brass and block tin tubing. 3/16" to ⅝". 94-F $2 50

IMPERIAL CHARGING LINE

Perfectly flexible, with brass core and 2 coverings. Length 25¾". Outer covering unaffected by oil or grease. 265-FT.....$1.10

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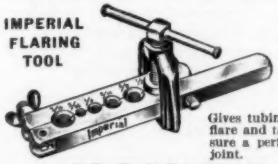

Gives tubing the right flare and taper to assure a perfectly tight joint.

93-F. For 3/16" to ½" tubing.....$3.00

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Order from your jobber.

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an educational engineering association to further the advancement of the refrigeration servicing profession.

This national organization of service men comprising the representative service men throughout the country is organized to serve its membership by keeping them currently informed on the advancement and developments in mechanical refrigeration.

It also provides an active organization which at all times represents and works for the best interests of the profession throughout the country.

If you are actively engaged in this profession, identify yourself with the organization which represents your interests. We suggest you write to National Headquarters for complete information as to how this Society is serving its membership.

A Local Chapter . . .

in your city. The National Society will aid in the formation of a local chapter. Ten or more active service men are required to form a chapter. The National Society will assist.

NATIONAL HEADQUARTERS,
REFRIGERATION SERVICE ENGINEERS' SOCIETY,
433 N. Waller Ave., Chicago, Ill.

Check one or both
☐ Please send me information regarding membership in the Society.
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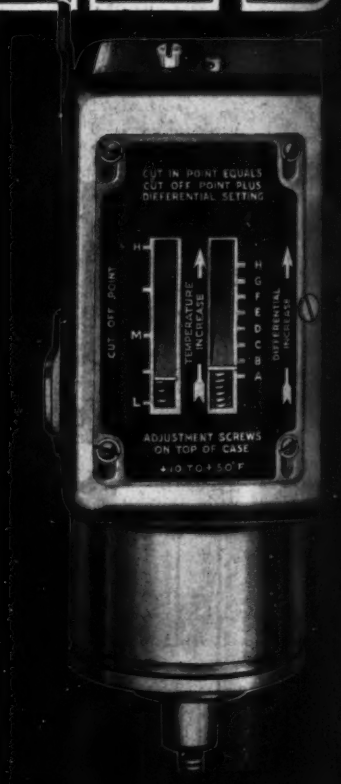

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Vol. 3
No. 6